

ABSTRACT

A near-field exposure method wherein a pressure difference is applied between a front face and a rear face of an elastically deformable exposure mask to cause deformation of the exposure mask in accordance with a substrate to be exposed, and to cause the exposure mask surface to follow a surface irregularity state of the substrate so that these surfaces closely contact each other, for exposure based on near field light. The method includes setting the pressure difference applied between the front and rear faces of the exposure mask at a predetermined pressure difference corresponding to a surface roughness of the substrate to be exposed. The predetermined pressure difference is set at a pressure difference larger than a minimum pressure P , which is determined to satisfy equation (1) below, in relation to a maximum surface roughness w at a measurement length a of the substrate to be exposed:

$$P = P_m + E \frac{16hw(4h^2 + (7 - \nu)w^2)}{3a^4(1 - \nu)} \quad \dots (1)$$

wherein h is a thickness of a thin-film mask base material, E is Young's modulus, ν is Poisson's ratio, and P_m is a pressure difference for roughly contacting a first substrate and a second substrate with each other.